OCCURRENCE OF *EICHHORNIA* FROM THE DECCAN INTERTRAPPEAN BEDS OF MADHYA PRADESH, INDIA

C. L. VERMA and UMA UPADHYAY
Botany Department, University of Lucknow, Lucknow 226 007, India.

THE fossiliferous material was collected from the Deccan Intertrappean beds exposed at Chhindwara in Madhya Pradesh.

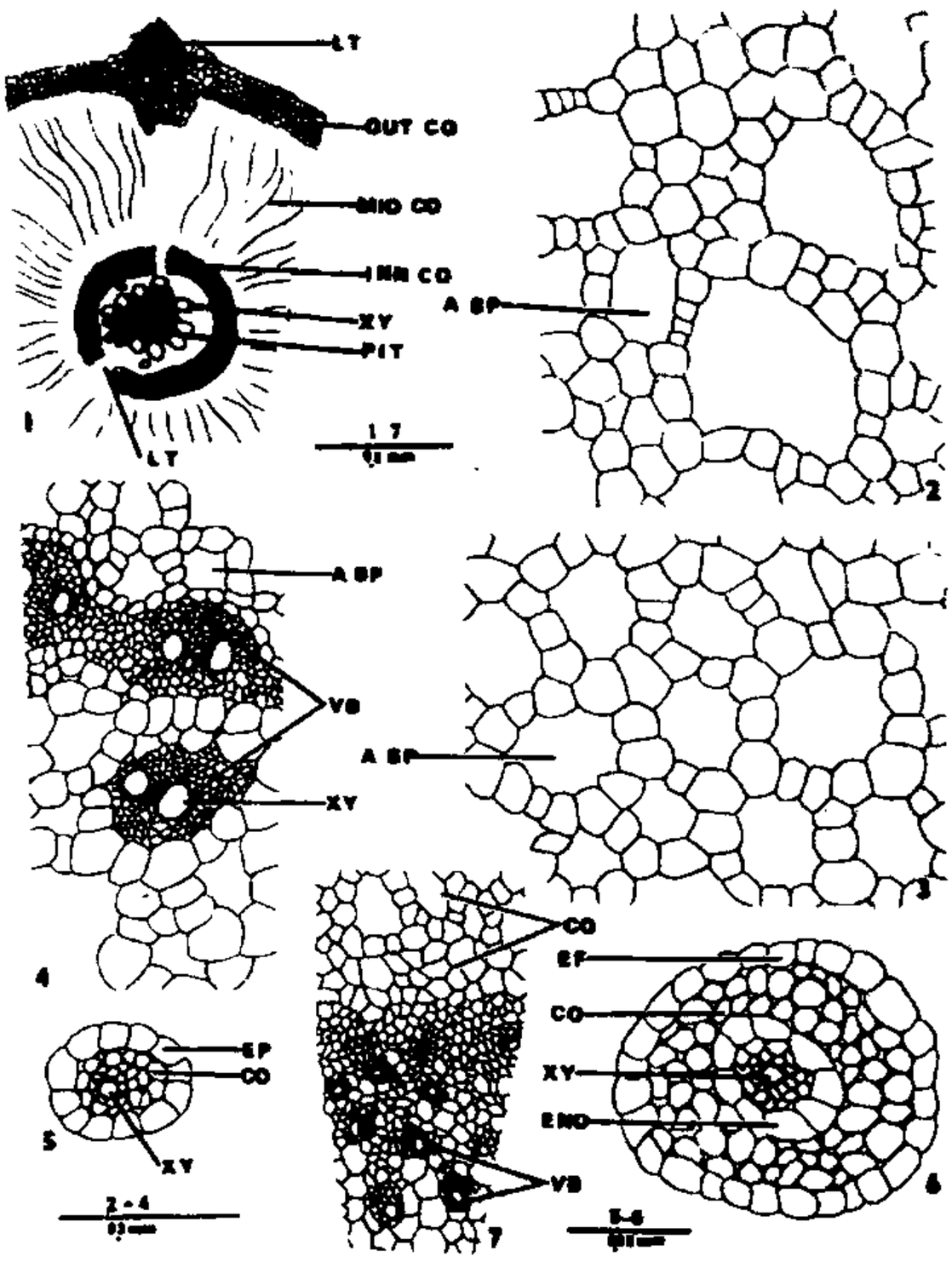
Rootlets: Well-preserved rootlets are 0.7–1.5 mm in diameter, differentiated into epidermis, cortex and stele. Epidermis is distinct and the cells are somewhat radially elongated (figures 5–6). This is followed by recognizable cortex consisting of parenchyma cells with numerous small air spaces. The endodermal layer is distinct only in a few rootlets. There are 1 or 2 xylem tracheids in the centre (figure 6).

Roots: Epidermal layer is distinct and consists of radially elongated cells. Cortex is wide and is differentiated into three zones *viz*. outer, middle and inner (figure 1). The outer and inner cortex are composed of parenchymatous cells. Outer cortex is 2–3 cells thick and compact, while the inner cortex is several cells thick with intracellular spaces. The middle zone possesses large air spaces separated by single cell wide parenchymatous septa.

The stele is polyarch with many exarch protoxylem groups (figure 1). Phloem is ill-preserved; xylem and phloem are alternately arranged. In the centre well-preserved sclerenchymatous pith is present (figure 1). The vascular zone is surrounded by recognizable endodermis. Lateral roots are also seen arising from the pericycle.

Stem: In cross-section the stem shows two zones *i.e.* cortical and central (figure 4). The two zones are separated by compactly arranged, distinct parenchymatous layer with crowded vascular bundles having 2–5 metaxylem and 1–3 protoxylem vessels (figure 4).

Cortical as well central zone have irregularly distributed vascular bundles. They are collateral, closed and endarch. Each bundle has usually 2 large metaxylem rarely 3–5 with a few protoxylem. Bundles are surrounded by small, slightly thickened parenchyma cells. The phloem cells are seen only in a few bundles. Both the zones have characteristic, large and regular spaces. These air spaces are separated by parenchymatous septa (figures 3, 4).



Figures 1–7. 1. T.S. of fossil root showing cortex stele and lateral roots. **2.** A part of the cortex of the axis of *Eichhornia crassipes*. **3.** A part of cortex of fossil axis showing regular air chambers. **4.** A part of the fossil axis showing cortical and central zones. **5, 6.** Small and large rootlets of fossil showing cellular details. **7.** A part of axis of *E. crassipes* showing cortical, central zones and vascular bundles. (A SP—air spaces; CO—cortex, EP—epidermis; END—endodermis; Inn CO—inner cortex; LT—lateral root; MID CO—middle cortex; OUT CO—outer cortex; PIT—pith; VS—vascular bundles; XY—xylem).

We have compared the present fossilize roots with the known roots and hydrophytic axes [1–7]. They have also been compared with the roots and axes of a large number of extant hydrophytic families[8,9]. Closer examination reveals that the roots and axes reported here closely compare with the corresponding organs of *Eichhornia crassipes* (Mart.) Solms.,[10,11] and aquatic plant belonging to the family Potendiriaceae (figures 1–4, 7).

The fossil on comparison shows closest resemblance with *Eichhornia*. The roots of the fossil form as well as the corresponding organs of *Eichhornia* resemble each

other closely in characters like: cortex differentiated into three zones, outer cortex-consists of thickened parenchyma cells, middle cortex comprises a number of large air chambers, inner cortex with round, regular parenchyma cells with air spaces. The stele is polyarch with exarch protoxylem. Pith is thick-walled and lateral roots originate from pericycle. The rootlets also resemble the rootlets of *Eichhornia* in the presence of 1–2 xylem tracheids and undifferentiated cortex with air spaces. The axis consists of cortex and central zones separated by parenchymatous region with crowded vascular bundles which are irregular, collateral and closed. Each bundle has 2–5 xylem tracheids and thickened surrounding cells. Ground tissue of both the zones has fairly regular air spaces. Obviously, all these characters show closest similarity with the axis of extant *Eichhornia*.

Thus it has been surmised that the fossil roots, rootlets and axes undoubtedly belong to the corresponding organs of *E. crassipes*. The occurrence of fossil *Eichhornia* in the Deccan Intertrappean beds throws light on the distribution and origin of the genus.

20 July 1985; Revised 16 September 1985

1. Chitaley, S. D., *Palaeobotanist*, 1968, **17**, 224.
2. Chitaley, S. D., *J. Indian Bot. Soc.*, 1968, **47**, 7.
3. Chitaley, S. D., Sheikh, M. T. and Rao, A. R., *Palaeobotanist*, 1970, **18**, 151.
4. Trivedi, B. S. and Ambwani, K., *Palaeontographica*, 1971, **133**, 135.
5. Trivedi, B. S., Verma, C. L. and Ambwani, K., *Curr. Sci.*, 1970, **39**, 241.
6. Trivedi, B. S., Verma, C. L. and Bajpai, S. K., *Geophytology*, 1982, **12**, 135.
7. Verma, C. L., *Curr. Sci.*, 1974, **43**, 289.
8. Arber, A., *Water plants, a study of the aquatic angiosperms*. Cambridge Univ. Press, London, 1920.
9. Metcalfe, C. R. and Chalk, L., *Anatomy of dicotyledons*. **1 & 2**, Oxford 1950.
10. Penfound, W. T. and Earle, T. T., *Ecol. Mongr.*, 1948, **18**, 447.
11. Sculthorpe, C. D., *The biology of aquatic vascular plants*, Edward Arnold, London, 1957.

MADURASIA OBSCURELLA JACOBY—A NEW VECTOR OF SOUTHERN BEAN MOSAIC VIRUS

D. R. R. REDDY and ANUPAM VARMA
Division of Mycology and Plant Pathology,
Indian Agricultural Research Institute,
New Delhi 110012, India.

IN 1982, a green mosaic disease of cowpea caused by southern bean mosaic virus (SBMV) was observed under Delhi conditions[1]. The diseased plants develop chlorotic patches on young and old leaves and the leaves were greener than healthy plants. A somewhat similar disease caused by three unusual strains of SBMV was earlier reported from Gorakhpur[2]. SBMV is known to be transmitted by phytophagous beetles, *Ceratoma trifurcata* in USA[3] and *Ootheca mutabils* in Nigeria[4]. Although the virus spreads in nature, no information was available about its natural vector in India. During the present investigations a vector of the virus was identified which is different from the known vectors and the results are reported here.

Galerucid beetle, *Madurasia obscurella* Jacoby (figure 1), the most common phytophagous beetle, causes serious damage to cowpea, mung bean, soybean and other legumes during *kharif* season in northern India. The beetles feed on plants during the dusk and early morning hours on leaves making small holes and during the day time they hide in soil crevices. Most serious damage is caused to the young plants. Feeding behaviour of these beetles is ideally suited for

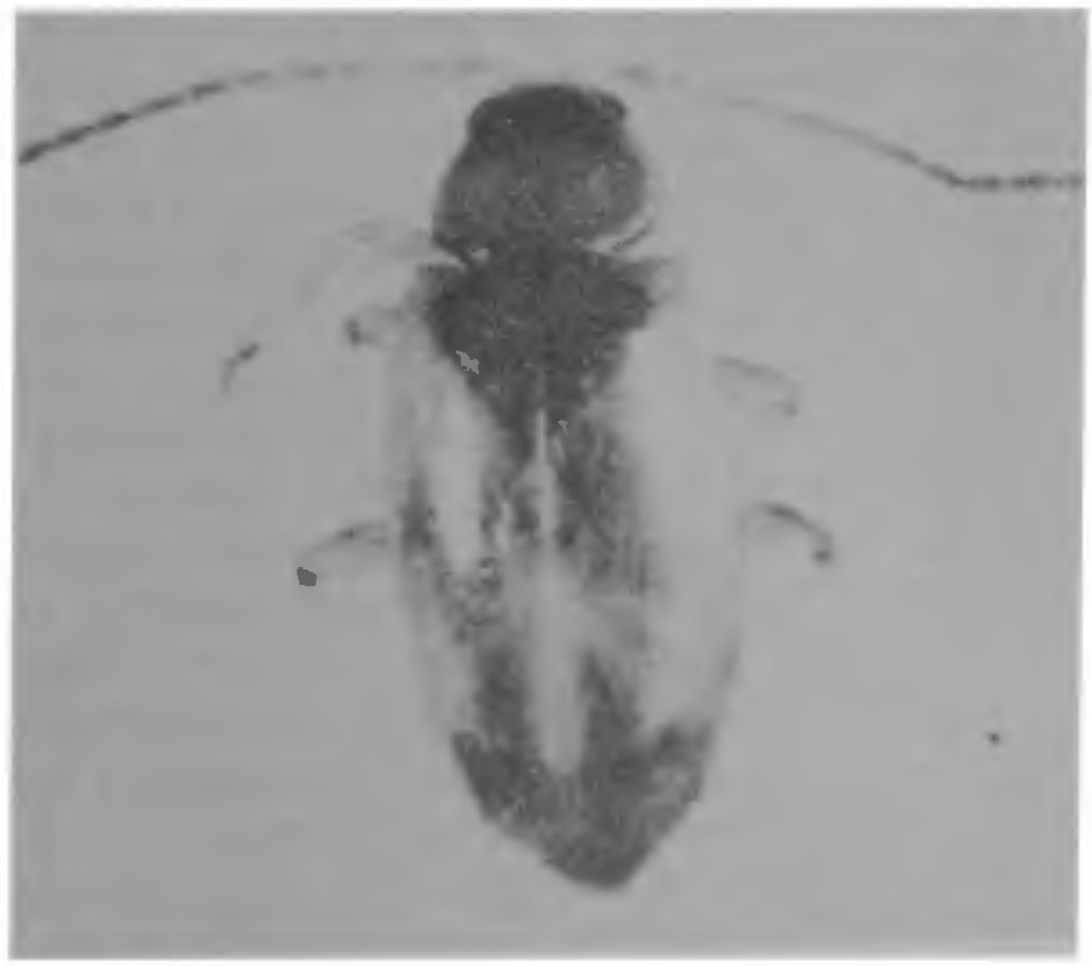


Figure 1. An adult *Madurasia obscurella*.